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# (54) IMPROVEMENTS RELATING TO MANHOLE COVERS

(71) We, STONER & SAUNDERS LIMITED, of 20 Woodfield Road, London, W.9, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to manhole covers. One conventional manhole cover is of cast iron construction which needs to be extremely thick and heavy when used in roadways, with consequent expense in manufacture and transport. They have poor resistance to shock loading. There is a need for strong covers of relatively light construction which can be easily made. It is an object of this invention to provide such a cover.

20 According to one aspect of the present invention there is provided a manhole cover comprising a sheet metal plate and metal side walls defining a space beneath said plate, and a reinforced concrete filling captive within said space.

25 In a preferred form the reinforcement comprises a grid or mesh of steel bars, at least some of which are secured to the side walls. The latter may have inturned flanges at their lower edges which trap the edges of the concrete infill and which serve to bear on a bed plate at the rim of the hole. The side walls themselves conveniently slope inwardly from the top plate. This in itself traps the concrete slab and makes lifting out the manhole cover from a surround frame relatively easy. The underside of the top plate will generally have protuberances which form anchorages in the concrete.

40 The metal work will preferably be all-welded.

45 According to another aspect of the present invention there is provided a manhole cover as defined above in combination with a frame providing a bed plate and side walls closely co-operative with the cover side walls, whereby the cover can seat within the frame with the cover plate flush with the top of the frame.

The frame and sides of the cover can have a close fit, preferably with tapered walls, and wear and "rock" are thus minimised.

The frame too will also preferably be of all-welded construction.

55 According to a further aspect of the present invention there is provided a method of making a manhole cover, wherein a metal "tray" is formed, concrete reinforcing members are secured within the tray, and concrete is poured therein to fill the latter, the structure being inverted when the concrete has set to form the cover.

60 It is sometimes necessary to close in a large hole where the use of a single cover slab of adequate strength would mean undesirable thickness and weight. This makes lifting it for access or inspection extremely difficult. Therefore it is a further object of this invention to provide in addition a manhole cover assembly where several slabs can be used in combination to close a hole. Each slab will generally be formed as the cover defined above, and the edge of the hole will be defined by a similar frame.

75 According to a yet further aspect of the present invention there is provided a manhole cover assembly having a plurality of slabs each substantially as the cover defined above and combinable to seat in a single frame, with means at adjacent edges of slabs providing support across the frame.

80 Each support may take the form of a transverse, removable beam with a shelf for each adjacent cover slab, the exposed upper surface of the beam being flush with the surfaces of the slabs when the latter are in place. Alternatively, or in addition, the edge of one slab may have a flange on which seats the edge of the next slab.

85 The invention may be performed in various ways and some constructional forms will now be described, by way of example, with reference to the accompanying drawings, in which:—

90 Figure 1 is a partly sectioned plan view of a manhole cover seated in a frame,

95 Figure 2 is a section on the line II—II of Figure 1,

Figure 3 is a plan view of a manhole cover assembly having two cover slabs,

Figure 4 is a plan view of a manhole cover assembly having four cover slabs,

5 Figure 5 is a section, to a larger scale and exploded, on the line X—X of Figure 3 or 4,

Figure 6 is a section, to a larger scale, on the line Y—Y of Figures 3 or 4, and

10 Figure 7 is a section, to a larger scale, on the line Z—Z of Figure 4.

In Figure 1 the top left hand corner is a plan view, as seen for example from the level A of Figure 2, while as one moves diagonally across Figure 1 towards the bottom right hand corner the sections are progressively at lower levels as indicated at B, C and D of Figure 2.

The structure shown is a manhole cover 10 seated in a frame 20. The cover is square in plan view and has a top plate 11 of 20 studded sheet metal, the studs being uppermost. At various points on the underside of the plate 11 there are welded U-shaped lugs 12 which will provide anchorages for the plate to the concrete. Side walls 13 of sheet metal are welded along the edges of the plate 11 and slope downwardly and inwardly and have inturned horizontal flanges 14. When 25 inverted, this sheet metal structure will form a shallow tray. A grid of reinforcing bars 15 is inserted in the space defined by the side walls 13 and the plate 11, most of these bars having hooked ends 15A turned back towards the plate 11. However, the end bars of 30 one parallel set are wholly straight and their ends are welded as at 16 to points on the insides of an opposite pair of side walls 13, low down near the flanges 14. When the reinforcement has been placed the concrete is poured and is levelled off flush with the outer faces of the flanges 14. When the concrete has set the structure is inverted and the cover is complete.

The frame 20 is of all-welded metal construction. It is square to correspond to the cover and comprises a bed plate 21 and side walls 22 each sloping upwardly and outwardly from about the centre of the respective leg of the bed plate, these side walls 50 having outwardly and horizontally extending flanges 23 at a level flush with the top of the cover 10 when the latter is seated by the flanges 14 on the bed plate 21. The slope of the side walls 22 is the same as that of the side walls 13 and there will be a small gap 55 between them. The side walls 22 are reinforced by gussets 24 welded at intervals along them and to the outer edge portion of the bed plate 21. This frame will generally be set in a concrete surround as indicated at 25.

60 It will be understood that the concrete filling can be done "on site", and the fabricated metal structure is relatively light and easy to transport compared with the completed structure. For example, one version is

560 lbs before the concrete filling and 1600 lbs after.

The manhole cover assembly of Figure 3 has two rectangular cover slabs 31 which fit within a rectangular frame 32. The constructions of the cover slabs and of the frame are almost identical to the single cover and frame described above and will not therefore be described in detail. However, along their adjacent edges the slabs are slightly different and are separated and supported by a transverse beam 33 as best seen in Figures 5 and 6. This beam is a box section, and to opposite sides are welded shelves 34 which will support the adjacent edges of the cover slabs at such a level that their tops will be level with the top of the beam 33. The shelves are reinforced by steel bars 35 entered transversely through holes drilled in the sides of the beam 33. Instead of being slightly angled, the edges of the cover slab that rest on the shelves are square and fit with clearance against the sides of the beam 33. For lifting the slab, slots 36 are cut in the top plate, near the edge, and open into pockets 37 90 formed by welded steel plates. The slots are smaller in plan than the pockets so that hooks or other lifting devices can engage under the lips of the slots. The steel lining of the pockets prevents water seeping into the concrete infill and obviates the need for a former when the concrete is poured. The cover of Figures 1 and 2 can be similarly equipped.

At the centre of each longer side of the frame 32 there is welded a stool or locating member 38 for receiving the end of the box section beam 33. Its outer periphery in end view is generally rectangular and slightly smaller than the internal section of the beam 33 above the level of the shelves 34. The end of the beam 33 is angled to fit against the sloping side of the frame and is cut away at 39 to fit over the bed plate 40 and against the side of the hole 41. The beam will be accurately located by these stools to span the middle of the frame 32.

The four slab cover of Figure 4 has a square frame 32<sup>1</sup> and two opposite sides of this are bridged in a similar manner to the arrangement of Figure 3 by a beam 33<sup>1</sup>. There remain two pairs of adjacent edges of slabs which are not supported by the frame 32<sup>1</sup> or by the beam 33<sup>1</sup>. They co-operate as shown in Figure 7. One of the slabs has an edge wall 42 that slopes outwardly and downwardly from the cover plate and is reinforced by an inner vertical wall 43 of thicker plate, this also serving to confine the concrete infill. To the lower edges of these walls 42, 43 there is welded a plate 44 which projects as a flange for supporting the edge of the other cover slab. This is formed in the same manner as the edges of the cover of Figures 1 and 2. Obviously, when placing these slabs, 130

the one with the strengthened, double-wall edge and the flange plate 44 is positioned first and the other one will follow and be supported around all four edges.

- 5 It will be understood that various arrangements using a different number of cover slabs can be made up. For example there may be three side-by-side slabs, each adjacent pair being separated by a beam similar to the  
10 beam 33.

#### WHAT WE CLAIM IS:—

- 15 1. A manhole cover comprising a sheet metal plate, and metal side walls defining a space beneath said plate, and a reinforced concrete filling captive within said space.

- 20 2. A manhole cover as claimed in claim 1, wherein the reinforcement comprises bars at least some of which are secured to the side walls.

- 25 3. A manhole cover as claimed in claim 1 or 2, wherein the side walls have intumed flanges at their lower edges which trap the edges of the concrete infill and which serve to bear on a bed plate at the rim of a manhole.

- 30 4. A manhole cover as claimed in claim 1, 2 or 3, wherein at least some of the side walls slope inwardly from the plate.

5. A manhole cover as claimed in any preceding claim, wherein the metal work is all welded.

- 35 6. A manhole cover as claimed in any preceding claim, wherein the underside of the plate has protuberances forming anchorages in the concrete.

- 40 7. A manhole cover as claimed in any preceding claim, in combination with a frame providing a bed plate and side walls closely co-operative with the cover side walls, whereby the cover can seat within the frame with the cover plate flush with the top of the frame.

- 45 8. A manhole cover and frame as claimed in claim 7, wherein the frame is of all welded metal construction.

9. A manhole cover assembly having a plurality of slabs each formed as the cover claimed in any one of claims 1 to 6, and combinable to seat in a frame as claimed in claim 7 or 8, there being means at adjacent edges of slabs providing support across the frame. 50

10. An assembly as claimed in claim 9, wherein the support means includes a transverse demountable beam with a supporting shelf for each adjacent cover slab, the exposed upper surface of the beam being flush with the surfaces of the slabs when the latter are in place. 55

11. An assembly as claimed in claim 9 or 10, wherein the support means includes at the edge of one slab a flange on which seats the edge of the next slab. 60

12. A method of making a manhole cover, wherein a metal "tray" is formed, concrete reinforcing members are secured within the tray, and concrete is poured therein to fill the latter, this structure being inverted when the concrete has set to form the cover. 65

13. A manhole cover substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings. 70

14. A manhole cover and frame substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings. 75

15. A manhole cover assembly substantially as hereinbefore described with reference to Figures 3, 5 and 6, or 4, 5, 6 and 7 of the accompanying drawings. 80

16. A method of making a manhole cover substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings. 85

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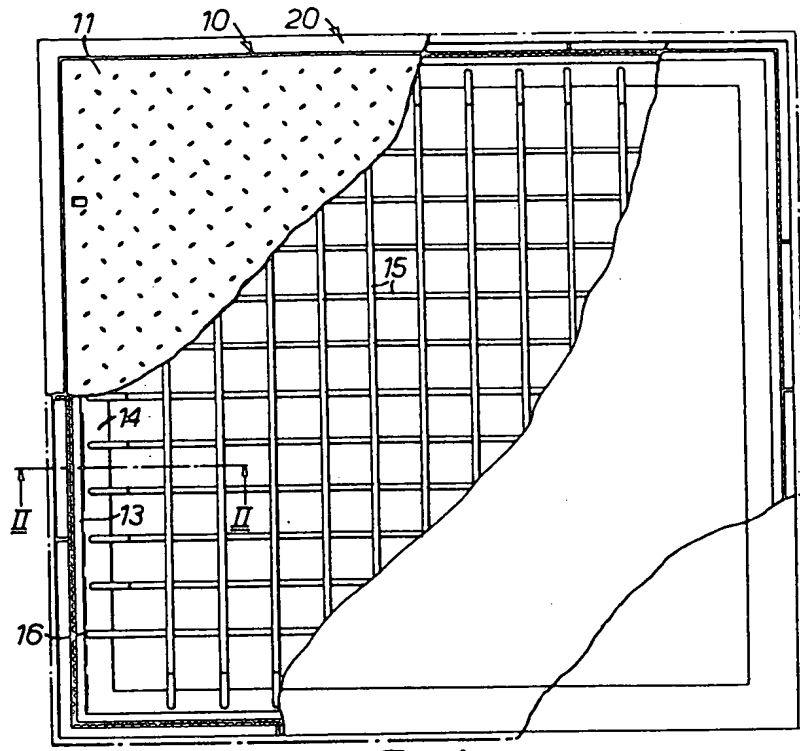


FIG. 1.

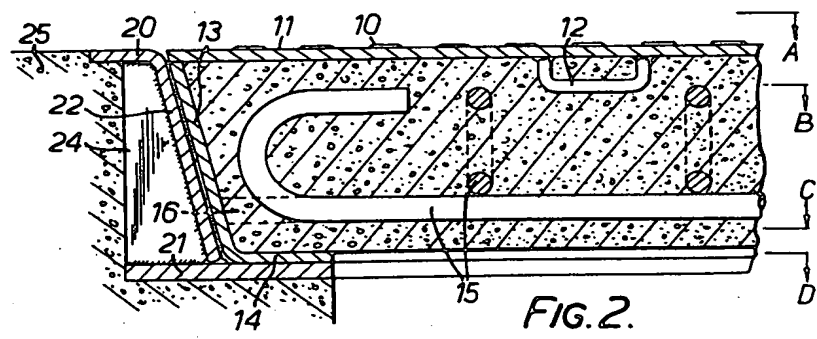


FIG. 2.

1. The first part of the document  
describes the general situation  
of the country and the  
population. It also mentions  
the main economic activities  
and the social structure.

2. The second part of the document  
describes the political situation  
and the government structure.

3. The third part of the document  
describes the cultural situation  
and the religious beliefs.

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COMPLETE SPECIFICATION

3 SHEETS

This drawing is a reproduction of  
the Original on a reduced scale  
Sheet 2

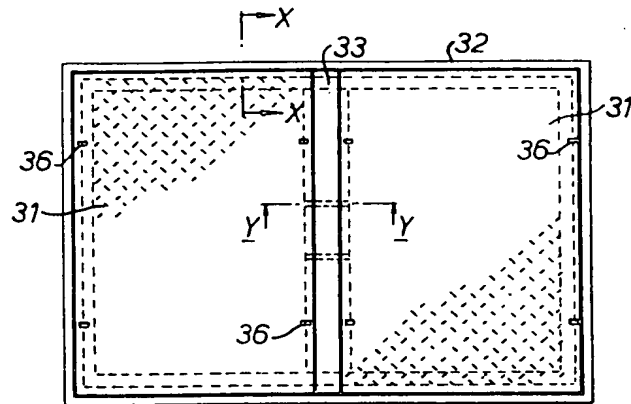


FIG. 3.

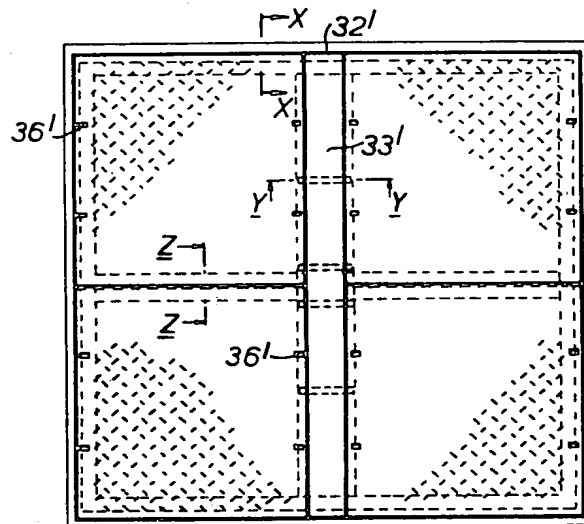


FIG. 4.





